Worker Behaviors

- Able to handle stress
- Appropriately dressed
- Common sense
- Communicative
- Conscientious
- Courteous
- Dependable
- Detail-oriented
- Effective
- Efficient
- Good personal hygiene
- Honest
- Imaginative
- Industrious
- Intuitive
- Mechanically inclined
- Open-minded
- Optimistic
- Persistent
- Professional
- Punctual
- Receptive
- Resourceful
- Self-confident
- Self-starter
- Team player
- Motivated
- Open-minded

Tools, Equipment, Supplies, and Materials

- Backhoe
- Bailer
- Blocking/cribbing
- Bobcat
- Buckets
- Cable
- Casing
- Casing locator
- Compressors
- Crane
- Desanders
- Develop/repair chemicals
- Disinfectants
- Dog house
- Downhole hammer
- Drill bits
- Drill collars
- Drill fluids
- Drill pipe
- Drill rig
- Drill stem
- Drive head
- Elevators
- Fishing tools
- Forklift
- Generators
- Global positioning system
- Grot
- Grout pumps
- Hand tools
- Inclination tool
- Jars
- Jetting tools
- Landing clamps
- Logging equipment
- Lubricants
- Marsh funnel
- Measurement equipment
- Mud additives
- Mud balance
- Mud gun
- Mud mixer
- Mud pumps
- Orifice
- Packers
- Personal protective equipment
- Pickup
- Portable mud pit
- Portalet
- Reports/logs/forms
- Rope socket
- Ropesocket/mandrel
- Sample bags
- Sample bottles
- Sample catcher
- Sand/filter pack
- Screens
- Shale shaker
- Shovels
- Slings
- Stabilizers
- Steam
- Sub adaptors
- Support truck
- Surge block
- Swab
- Test pumps
- Thermometer
- Torch
- Trencher
- Video camera
- Water
- Water meter
- Water test kit
- Weir
- Welder
- Wrenches

General Knowledge and Skills

- Active listening
- Building and construction
- Chemistry
- Complex problem solving
- Coordination
- Critical thinking
- Customer and personal services
- Design
- Engineering and technology
- Equipment maintenance
- Equipment selection
- Geology
- Installation
- Instructing
- Judgment and decision making
- Law and government
- Management of material resources
- Management of personnel resources
- Management of resources
- Management of time
- Marketing
- Math skills
- Mechanical skills
- Monitoring
- Operation and control
- Personnel and human resources
- Physics
- Public safety and security
- Quality control analysis
- Reading comprehension
- Repairing
- Science (geology)
- Speaking
- Time management
- Transportation
- Troubleshooting

Acronyms

- ASR: aquifer storage and recovery
- CDL: commercial driver’s license
- CPI: Certified Pump Installer
- CWD: Certified Well Driller
- DOT: Department of Transportation
- EPA: Environmental Protection Agency
- GPM: gallons per minute
- GWV: gross vehicle weight
- GW: groundwater
- Haz-Mat: hazardous materials
- HAZWOPER: hazardous waste operations and emergency response standards
- MDL: minimum detection level
- MGWC: Master Groundwater Contractor
- OJT: on-the-job training
- OSHA: Occupational Safety and Health Administration
- P&C: property and casualty
- PL: pumping level
- PM: preventive maintenance
- PM: project manager
- PBB: parts per billion
- PPE: personal protective equipment
- PPM: parts per million
- Pre-trip: DOT-required pre-trip inspection of truck
- PSI: pounds per square inch
- SW: surface water
- SWL: static water level
- TDH: total dynamic head
- CETE/OSU: Center on Education and Training for Employment/The Ohio State University

DACUM Research Chart

Drilling Contractors and Operators

Research Panel

- John Henrich, MGWC/CVCLD
- Bergerson-Caswell Inc. Maple Plain, Minnesota
- Gary L. Hix, CWD/PI
- Owner
- In2Wells LLC
- Tuscon, Arizona
- Rod E. Jenkins, CWD
- Owner/Operator
- Hall and Jenkins Well Drilling
- New Carlisle, Ohio
- Ron McAfee, CWD/PI/CSP-II
- Owner
- The Water Mechanic
- Clover, South Carolina
- Ernest Pender, MGWC
- President
- Pender Water Wells
- Texarkana, Texas
- Roger E. Renner, MGWC
- President/CEO
- E. H. Renner & Sons Inc.
- Elk River, Minnesota
- Steve Schneider, MGWC
- Vice President
- Schneider Water Services
- St. Paul, Oregon

Research Facilitators

- Robert E. Norton, CETE/OSU
- Luigi Ferraro, CETE/OSU
- Erich Fein, CETE/OSU

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### DACUM Research Chart for Drilling Contractors and Operators

<table>
<thead>
<tr>
<th>Duties</th>
<th>Tasks</th>
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</thead>
<tbody>
<tr>
<td><strong>B. Develop Project Plan</strong></td>
<td>B-1. Research geological/hydro-geological conditions (e.g., well records)</td>
</tr>
<tr>
<td><strong>C. Initiate Project Plan</strong></td>
<td>C-1. Obtain required permits (e.g., notice of intent, start cards, notifications)</td>
</tr>
<tr>
<td><strong>D. Mobilize for the Site</strong></td>
<td>D-1. Prepare drilling equipment (e.g., pre-trip, safety, preventive maintenance)</td>
</tr>
<tr>
<td><strong>E. Construct Water Well</strong></td>
<td>E-1. Perform equipment maintenance and startup (e.g., inspect drill bit)</td>
</tr>
<tr>
<td><strong>F. Rehabilitate Wells</strong></td>
<td>F-1. Determine existing well construction</td>
</tr>
<tr>
<td><strong>G. Develop Wells</strong></td>
<td>G-1. Install development tools and equipment</td>
</tr>
<tr>
<td><strong>H. Decommission Wells</strong></td>
<td>H-1. Determine existing well construction</td>
</tr>
<tr>
<td><strong>I. Mobilize the Site</strong></td>
<td>I-1. Create downhole video log of well</td>
</tr>
<tr>
<td><strong>J. Close Out Project</strong></td>
<td>J-1. Document well construction (e.g., reports, well logs)</td>
</tr>
<tr>
<td><strong>L. Pursue Professional Development</strong></td>
<td>L-1. Assess training needs</td>
</tr>
</tbody>
</table>

### Additional Notes
- **Client Inquiry:** Respond to financial resources (e.g., well records) and geological/hydrogeological research of intent, start cards, and equipment needs (e.g., pre-trip, drilling equipment maintenance and communications).
- **Preparation:** Include safety, preventive maintenance (e.g., pre-trip, drilling equipment maintenance), and materials (e.g., pre-trip, drilling equipment maintenance).
- **Construction:** Perform equipment (e.g., underdrilling), drill borehole (e.g., underdrilling), and equipment (e.g., pre-trip, drilling equipment maintenance).
- **Operations:** Include construction and equipment (e.g., underreaming, jetting, swabbing, roustabouting).
- **Completion:** Prepare well development tools (e.g., pre-trip, drilling equipment maintenance), and chemicals (e.g., well formation fluids).